Manned Ground Vehicles —

Redefining System Development

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Delivered by tactical airlift, the manned ground vehicle (MGV) fleet moves into initial position. Unit of action (UA) commanders at all levels issue orders while on the move from command and control vehicles (C2Vs), according to intelligence analysis derived from fused sensor input from the Reconnaissance and Surveillance Vehicle (R&SV) and Joint, Interagency and Multinational assets. Superior mobility and integrated fires allow the Non-Line-of-Sight Cannons (NLOS-C), mortars and the beyond-line-of-sight (BLOS) capability of the Mounted Combat System (MCS) to engage enemy targets in-depth, coordinated with other UAs, units of employment (UEs) and Joint service assets under the control of the combatant commander via an unprecedented networked lethality capability.

Having set the conditions for an overwhelming advantage, the Infantry Carrier Vehicles (ICVs) and MCSs move in to secure key objectives under the watchful eye of the R&SV and unmanned ground and air vehicles. Advanced Medical Vehicles (MVs) provide evacuation and immediate treatment capability as required during the operation.

The goal is to see first, understand first, act first and finish decisively. As envisioned in the Maneuver UA Operational and Organizational Plan, the FCS MGV family development focuses on integration of Soldiers, situational awareness, sensors, shooters, survivability and sustainment. Unlike predecessor programs, FCS manned ground system development focuses on the design of an interdependent family of vehicles, structured within the overarching UA network to maximize combined capability rather than individual system prowess. Success in this endeavor relies heavily on the coordinate contributions of many other key elements of the overall FCS program, including command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR); training; logistics and lethality efforts to achieve operational goals.

In addition to the features normally found on individual combat systems, FCS MGV development is oriented to significantly improve operational availability, reduce logistics system burden and simplify operator interfaces. This is consistent with the goal to build the system around the Soldier rather than forcing the Soldier to adapt to the system. An embedded Personnel and Materiel Readiness Monitoring System will provide commanders key health monitoring information on the status of fuel, ammunition, system

readiness and personnel health to assist in campaign planning.

Key features of the MGV family include a simplified two-level maintenance concept, onboard water generation capability, embedded training, diagnostics and prognostics and rapid resupply. Within the framework of holistically addressing interdependencies at the systems level, the FCS MGV development must pay close attention to C4ISR integration, power management, electronics architecture and data management.

As with lethality, survivability within the MGV family relies on a stepped approach focused on minimizing potential exposure to overmatching threats via situational awareness culminating in advanced active protection systems, novel active armor solutions and advanced materiel design for passive protection. This layered approach to MGV survivability is essential to achieving other mobility and transportability boundary conditions.

To achieve these goals, MGV development is segmented into two principal areas: common core systems and mission variants. The common core systems are provided to all variant development teams for integration with mission equipment packages. This common approach further helps reduce the logistics burden of the manned vehicle fleet and provides for economy of scale during the procurement phase of the program.

Common Systems

The FCS MGVs are structured around a series of 12 common systems and a series of mission modules, resulting in eight variants. The intention of the developmental effort is to optimize commonality throughout the family of vehicles where it makes sense, and to construct a deliberate decision process to determine when being common is not feasible. In most other family-of-systems programs to date, a single variant is used as the lead vehicle from which each of the remaining family of vehicles evolves. While it may appear to be subtle, the common design of this family of vehicles is not initially influenced by a dominant variant but focuses on taking a balanced approach to meeting the capabilities required by the whole family. Operational requirements documentation reinforces the approach by dividing MGV requirements into a set of common core needs such as mobility capabilities and mission-specific requirements such as indirect fire capability as in the case of the NLOS-C.

A Common Design Concept for FCS

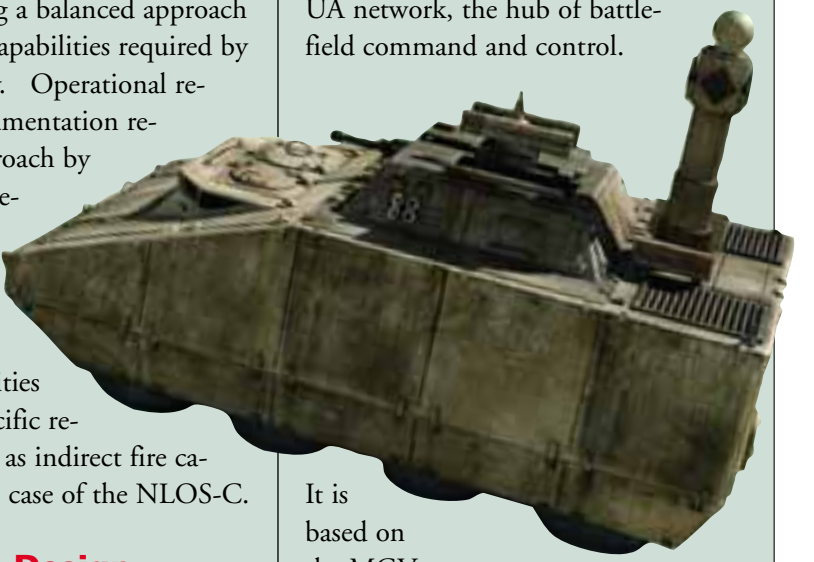
While these 12 common systems would typically be treated as standalone components, their interdependencies mandate an integrated approach for developing the common core without suboptimizing MGV variants' mission contribution at the system-of-systems (SoS) level. This led to a natural grouping of systems into certain core areas. As each variant design evolves, deviation from the influence of the common contribution to system design is by exception only.

The Variants

The FCS program defined in Increment I initial fielding consists of seven vehicle variants, each providing key enablers for execution of the UA SoS strategy. When integrated into the FCS network of sensors and communications, these network-enabled mission equipment packages based on the common mobility platform deliver the command and control, intelligence, and fire-power necessary to realize the vision of the Maneuver UA Operational and Organizational Plan.

C2V

The C2V is the central node of the UA network, the hub of battlefield command and control.



It is based on the MGV common platform. The C2V platform provides for information management of the integrated network of communications and sensor capability within the UA and provides the tools for commanders to synchronize their knowledge of combat power with the human dimension of leadership. It is located within the headquarters sections at each echelon of the UA down to the company level, and when integrated with the C4ISR suite of equipment, it provides commanders command and control on the move.

The C2V contains all the interfaces required to enable the commander to leverage the power of the C4ISR network and provides the means for leaders at all levels to achieve information

superiority and situational understanding and to establish, maintain and distribute a common operating picture fused from the friendly, enemy, civilian, weather and terrain situations while on the move. The crew uses its integrated C4ISR suite (communication, computers and sensor systems) to receive, analyze and transmit tactical information via voice, video and data inside and outside the UA. The C2V can also employ unmanned systems, such as unattended ground sensors and unmanned ground and air vehicles to enhance situational awareness throughout the UA.

ICV

The ICV delivers 9-person infantry squads to a location from which they will conduct a close assault. The ICV will effectively employ weapon systems and rapidly maneuver during blackout, day and night operations, inclement weather, and limited visibility periods. The ICV will deliver the dismounted force to the close battle and support the squad by providing self-defense and supporting fires. The ICV carries the majority of equipment freeing the individual Soldier to focus on mission. The squad will have access to Army and Joint fire delivery systems from external sources to provide extended range, networked responsive precision or volume fires on demand in support of tactical maneuvers. The ICV can move, shoot, communicate, detect threats and protect crew and critical components under most land-surface environments. Data transfer with other components of the UA permits constant update of the common operational picture and rapid identification of targets making the ICV the infantry carrier for the 21st century.

MCS

The MCS provides direct and BLOS offensive firepower capability allowing UAs to close with and destroy enemy forces in support of the operations plan. The MCS delivers precision fires at a rapid rate to destroy multiple targets at standoff ranges quickly and complements the fires of other systems in the UA. It is highly mobile and maneuvers out of contact to positions of advantage. It is capable of providing direct support to the dismounted infantry in an assault,

defeating bunkers and breaching walls during the tactical assault. The MCS also provides BLOS fires through the integrated sensor network. BLOS fires from an MCS provide in-depth destruction of point targets up to 8 kilometers away from the target. This capability significantly increases the options available to the UA commander for the destruction of point targets through the integrated fires network enhancing SoS lethality. The MCS will consist of the common MGV chassis and an autoloading line of sight and BLOS capabilities.

R&SV

The R&SV serves as a vital component of the integrated, SoS approach to development of the tactical, operational and strategic situations. R&SVs are agile, stealthy vehicles that use advanced sensors to rapidly detect, locate and discriminate multiple threats while remaining undetected themselves. These features, in conjunction with a dynamic hunter-killer capability using onboard systems and other organic UA, UE, Joint, and coalition lethal systems enable the R&SV to avoid detection, move quickly and facilitate the UA to close with and destroy enemy forces. C4ISR links facilitate critical data and information exchange with other UA, UE, Joint forces, theater and national assets.

R&SVs feature a suite of advanced sensors to detect, locate, track, classify and automatically identify targets from increased standoff ranges under all climatic conditions, day or night. Included in this suite are a mast-mounted, long-range electro-optic infrared sensor, a Prophet emitter mapping sensor for radio frequency (RF) intercept and direction finding, the Joint Service Lightweight Stand-off Chemical Agent Detector for remote chemical detection and a multifunction RF sensor. R&SVs also feature the onboard capability to conduct automatic target detection, aided target recognition and Level I sensor fusion. To further enhance the scout's capabilities, R&SVs are also equipped with unattended ground sensors, small unmanned ground vehicles with their own suite of sensors and two unmanned aerial vehicles.

NLOS-C

The NLOS-C provides unprecedented responsiveness and lethality to the UA commander. The NLOS-C provides networked, extended-range targeting and precision attack of point and area

targets in support of the UA with a suite of munitions that include special purpose capabilities. The NLOS-C provides sustained fires for close support and destructive fires for tactical standoff engagement. The system's primary purpose is to provide responsive fires in support of the FCS Combined Arms Battalions and their subordinate units in concert with line-of-sight, BLOS, NLOS, external and Joint capabilities. The system provides flexible support through its ability to change effects round-by-round and mission-by-mission. These capabilities, combined with rapid response to calls for fire and rate of fire, provide a variety of effects on demand.

The cannon will be able to move rapidly, stop quickly and deliver lethal first round effects on target in record time. The NLOS Cannon will have a multiple round-simultaneous impact (MRSI) capability. The MRSI capability, coupled with the NLOS-C's superior sustained rate of fire, will provide record effects on target from a smaller number of systems. The cannon, like all MGV variants, can rapidly rearm and refuel, and its system weight makes it uniquely deployable. Fully automated handling, loading and firing will be another centerpiece of the NLOS-C. The NLOS-C balances deployability and sustainability with responsiveness, lethality, survivability, agility and versatility.

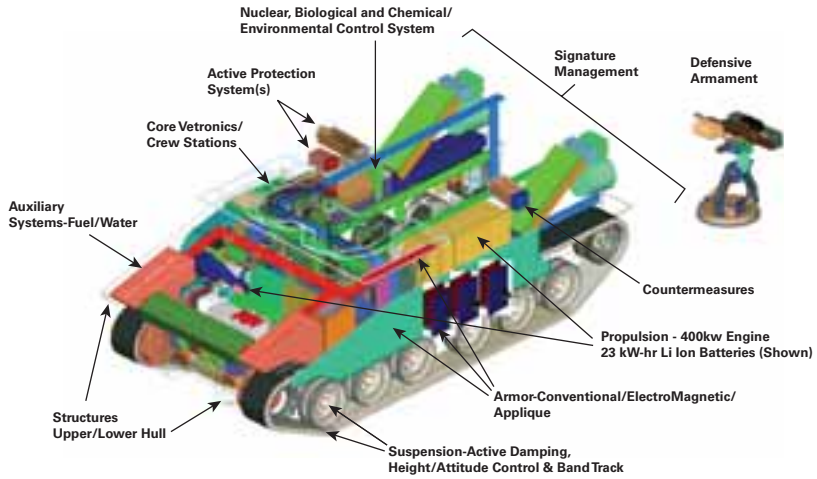
Non-Line-of-Sight Mortar (NLOS-M)

The NLOS-M provides unparalleled responsiveness and lethality to the UA commander. The mortar provides fires in close support of tactical maneuvers that include destructive fires and special purpose fires. While working as part of an NLOS-M battery, the NLOS mortar-firing Precision Guided Mortar Munitions will deliver lethal fires to destroy high payoff and most dangerous targets and provide area suppression in support of UA companies and platoons. The mortar and platoon are highly flexible and agile in establishing sensor-shooter linkages. It provides highly responsive, reliable, timely, accurate and sustained rates of fire and rates of kill with 24/7 availability in all weather and terrain conditions at extended ranges.

The NLOS-M system provides precision-guided fires to destroy, protective fires to suppress and obscure the enemy and illumination fires all in close support of UA Combined Arms Battalions maneuver units. The platoon provides responsiveness with fires on-demand to engage complex and simultaneous target sets. The C4ISR network enables the FCS NLOS-M fire control system to conduct semi- to autonomous computation of technical fire direction, automatic gun lay, preparation of the ammunition for firing and mortar round firing. Vastly improved handling, loading and firing systems will be another centerpiece of the NLOS-M. The mortar platoon will retain a dismounted 81mm mortar capability for complex terrain.

MV

The Treatment/Evacuation MV serves as the primary medical system within the UA. It will have two mission modules (evacuation and treatment). The time-sensitive nature of treating critically injured soldiers requires an immediately responsive force health protection system with an expedient field evacuation system. These functions will be accomplished by having an FCS MV-Evacuation (MV-E) vehicle, internally configured for casualty evacuation, and the MV-Treatment (MV-T) vehicle, internally configured for patient treatment, rapidly collect, stabilize



Common Systems

and transport casualties. These vehicles are designed to provide advanced trauma life support within 1 hour to critically injured soldiers. Both FCS MV mission modules will be capable of conducting medical procedures and treatments using installed networked telemedicine interfaces, Medical Communications for Combat Casualty Care and the Theater Medical Information Program. The MV-E and MV-T are integral variants of the FCS program that contribute to sustaining and generating combat power to the Future Force structure.

Demonstrating Concepts

To support the development of FCS MGV weapon systems, an FCS systems engineering tool was developed to leverage and transition technologies from the Crusader program into the FCS program. The NLOS-C System Demonstrator was built and sent to Yuma Proving Ground, AZ, to undergo firing and mobility assessments. The FCS team is using the System Demonstrator to evaluate the stability of a 155mm cannon firing from a 20-ton vehicle, demonstrate the weapon module's ability to execute rate-of-fire missions, cannon automation, gun point and control. A mobility evaluation will also be conducted on representative mobility technologies including hybrid electric drives and new band tracks representing common platform capability across all MGV platforms. FCS engineers will use collected data to correlate and improve vehicle concept models.

Another key to successful development of the MGV family is the unprecedented involvement of the warfighting community. Through the U.S. Army Training and Doctrine Command (TRADOC) Systems Manager, the FCS MGV effort relies heavily on subject matter experts to support the design decision process and the evaluation process. A full partner in MGV concept development and assessment, TRADOC plays a key role in assisting the materiel developer in achieving the MGV vision.

The MGV program is structured like no other vehicle development program from the past. The approach focuses on development of a family of vehicles that provide unmatched capability at the SoS level, sacrificing the optimization of any single platform to maximize synergy and warfighting benefit at the UA level. Heavy emphasis on logistics considerations provides significant reinforcement of the sustainment strategy and efforts to reduce the logistics footprint. In conjunction with new approaches to networked survivability and lethality, the MGV family will live up to its goal of providing the combatant commander a lighter, more lethal force able to engage decisively across the full spectrum of future conflict and focused on enabling Soldiers' capabilities.

The NLOS-C System Demonstrator fires its first round on Aug. 26, 2003, in support of firing and mobility assessments for FCS MGVs.

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